GOES-R ADVANCED BASELINE IMAGER (ABI): THE NEXT GENERATION OF GEOSTATIONARY IMAGER WEATHER AND ENVIRONMENTAL PRODUCTS

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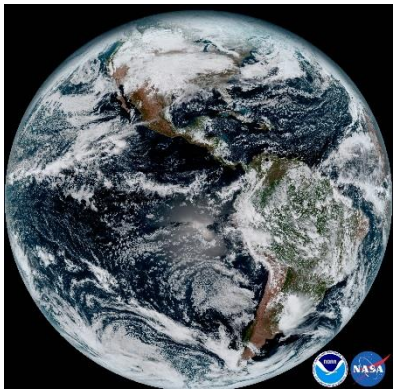
ABI – Paradigm Shift in Geostationary Weather Imaging

3x spectral, 4x spatial, and 5x temporal resolution improves quality and types of products as well as timeliness

Improved calibration targets and vicarious calibration capabilities yield more accurate images, improving data products

Interleaved scene collection capability provides unprecedented operational flexibility

- One instrument collecting multiple scenes of different sizes, locations, and revisit intervals seamlessly interleaved
  - GOES-15 Imager: Interrupt CONUS observations for periodic Full Disk or (occasionally) rapid scan of storms
  - GOES-R ABI: Full Disk, CONUS, and Mesoscales interleaved (everything all the time!)



Images courtesy of GOES-R, CIRA, and Harris

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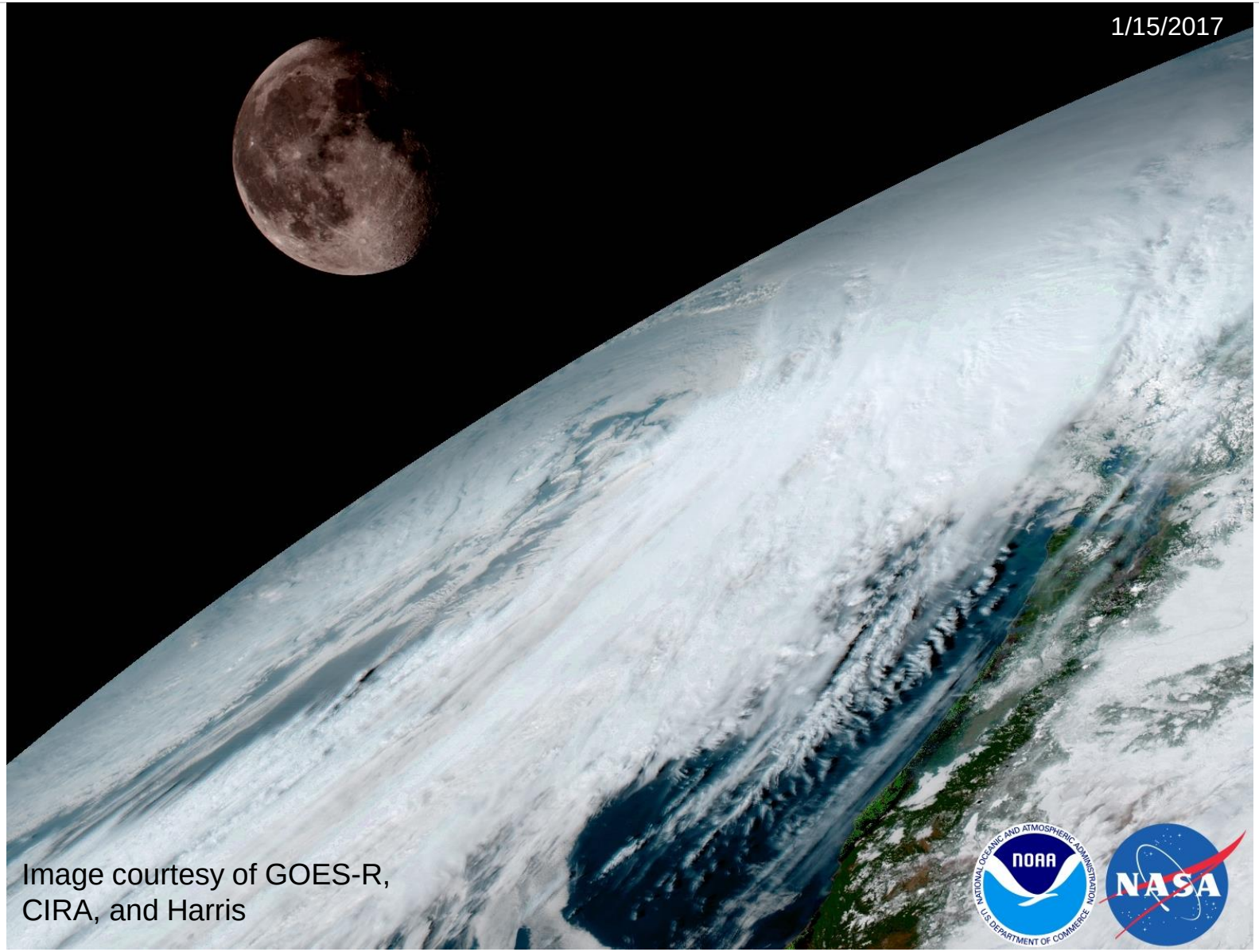
ABI Full Disk Scan Captured Moon Image



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Agenda

ABI Design Overview

ABI Timelines

Post Launch Test Plans

ABI PFM Milestones:

- 19Nov2016: Launched
- 7Jan2017: Optical Port Cover Opened
- 10Jan2017: Detectors Cooled
- 15Jan2017: Official First Image Collected

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Other ABI-related Presentations This Week

Tuesday [Special Symposium on Severe Local Storms]

- 4:30 4.2 NOAA New Generation Satellite Capabilities for Improved Severe Storm Forecasts and Warnings

Wednesday [13NGOESS]

- 9:30 7.5 GOES-R: ABI Mode and Mesoscale Domain Sector Request Process
- 10:45 8.2 Near Real Time High Resolution All-Weather Atmospheric Total Precipitable Water and Layered Precipitable Water Products from GOES-R ABI and Their Applications in Weather Forecasts
- 4:15 10.2 Initial On-orbit Advanced Baseline Imager (ABI) Performance Observations
- 4:30 10.3 A Post Launch Field Campaign for GOES-R
- 4:45 10.4 Introducing ABI North South Scans for Post-Launch Validation

Thursday [13NGOESS]

- 11:45 13.6 Data Processing of GOES-R ABI Special Calibration Scans
- 2:00 15.3 Enhanced Precipitation Estimation using GOES-R
- 2:30 15.5 Fire Detection in the Age of GOES-R
- 2:30 16.5 The Calibration/Validation Strategy for GOES-R

Etc.

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ABI's 2-Mirror Scanner Key to Operational Flexibility and Improved Calibration Capability

Scans parallel to equator without rotating image

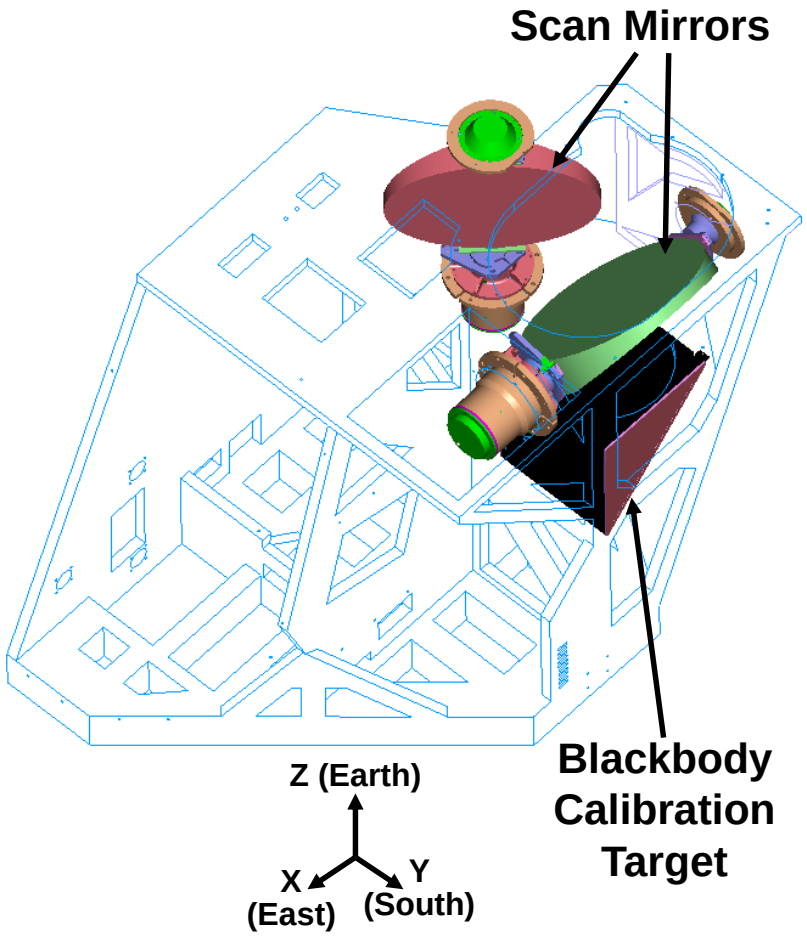
- 100% scan coverage efficiency

Lowest inertia and power

2x EW and NS mechanical-to-optical motion

Inherently polarization compensating

- At nadir, polarization introduced by reflection off NS scanner is canceled by reflection off of EW scanner
- Blackbody located anti-nadir, so same observing geometry applies



Delivers fast slews and accurate slow scans with minimal disturbance

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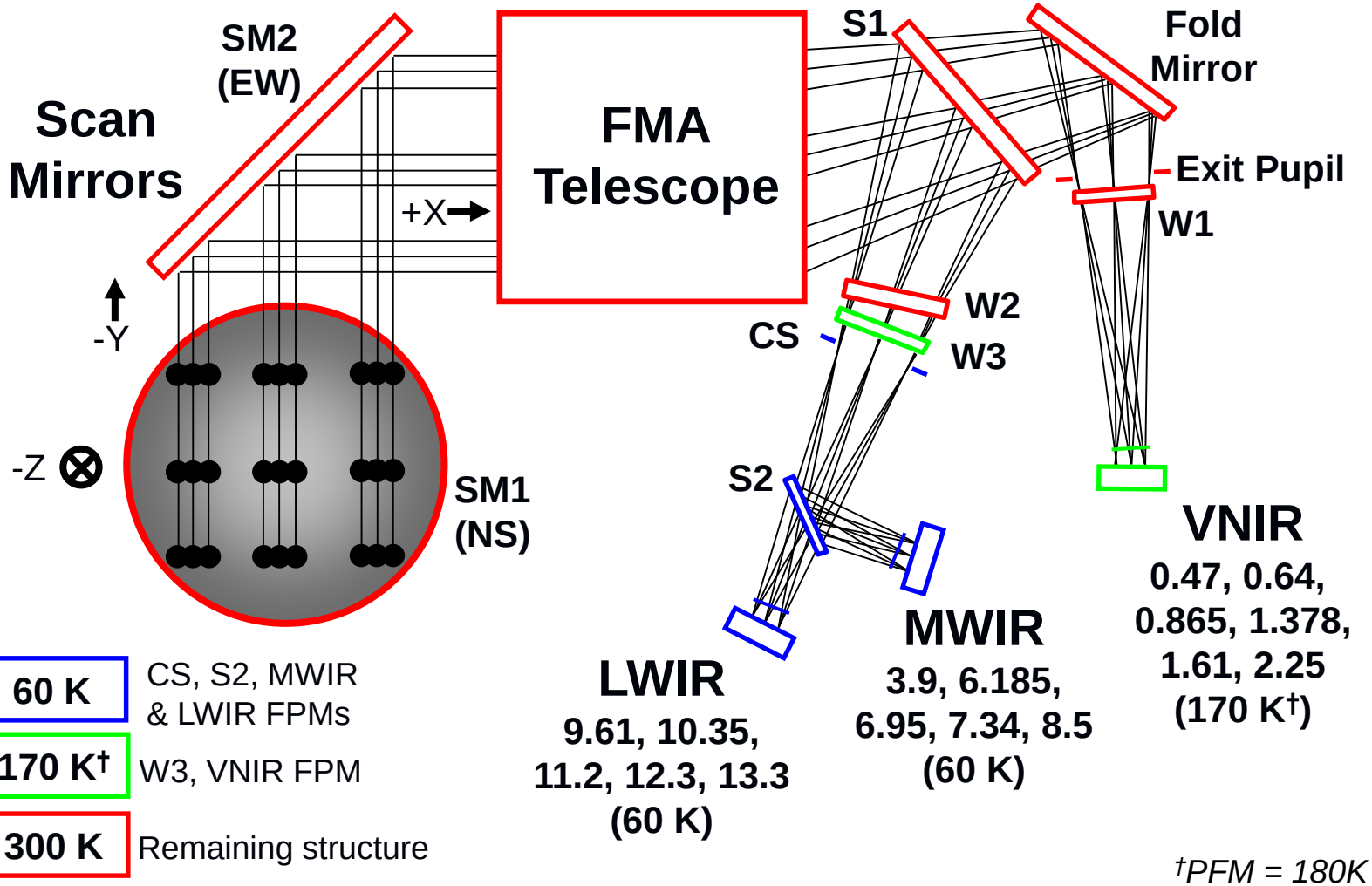
ABI Optical Architecture: Simple Solution to Mission Needs



†PFM = 180K

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Flexible Data Collections Demonstrated on All ABI-Class Flight Instruments

Continuous Full Disk (CFD):

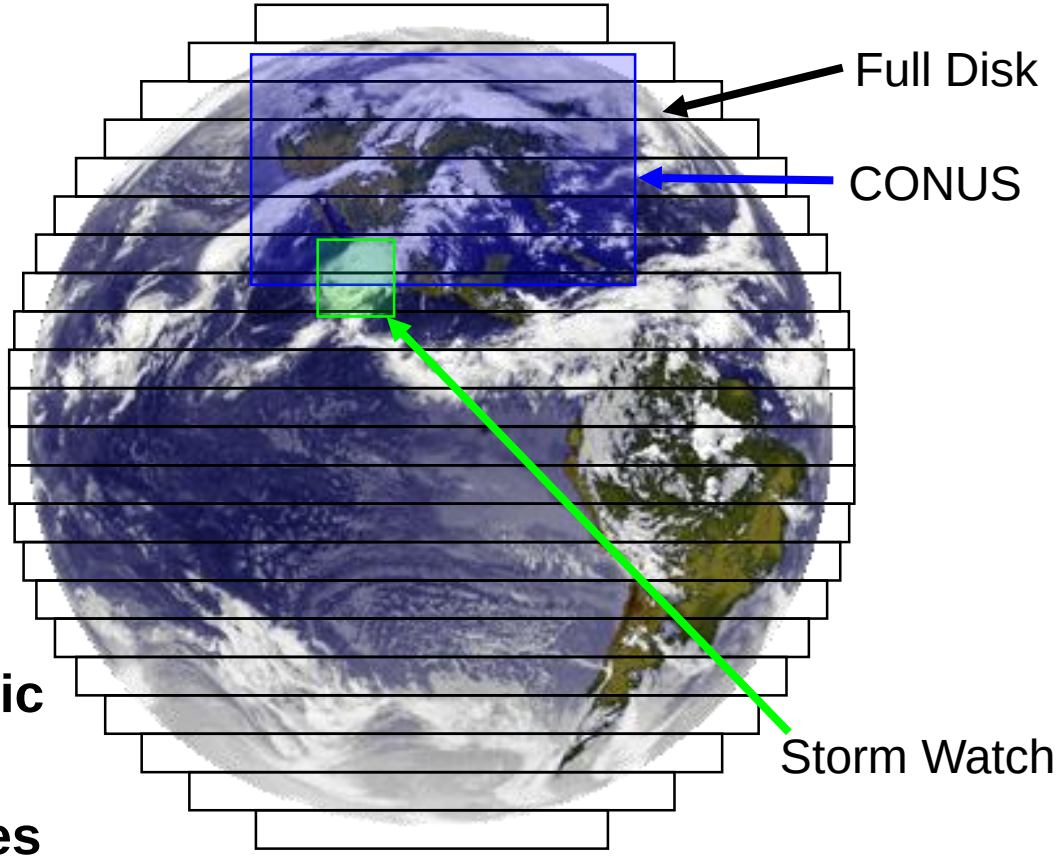
- Timeline: ABI Scan Mode 4
- 5 minute Full Disk

Flex Mode (Storm Watch):

- Timeline: ABI Scan Mode 3
- 30-second mesoscale
- 5-minute CONUS
- 15-minute Full Disk
- Seamlessly interleaved

Blackbody, spacelooks, & stars included for radiometric calibration and navigation

Custom scenes and timelines uploadable on demand



User can design and load any desired timeline;
Meso can be repositioned on the fly (no interruptions)

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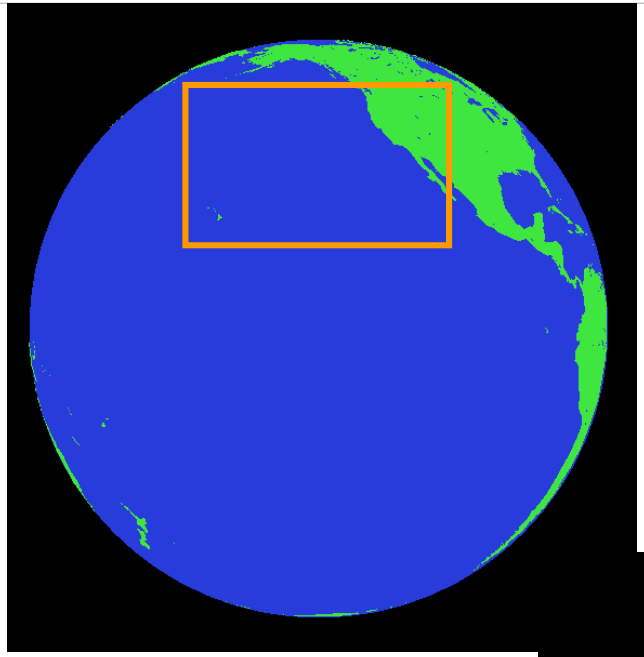
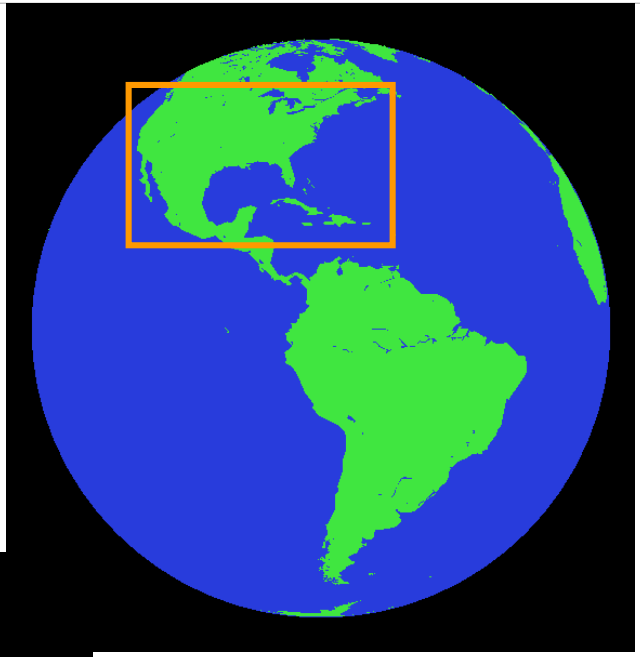
ABI CONUS: Same Size But Different Location For Each Satellite



GOES-R West
(137°W)

GOES-R Central
(89.5°W)



GOES-R East
(75°W)

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ABI Timelines: MP3 Player Analogy

ABI	MP3 Player
Scene	Album
Swath	Track
Scan	Listen
Slew	Change tracks
Timeline	Playlist

Timeline defines which swaths to collect, in what order, and when to collect each one

Timelines are uploadable any time during mission

Harris' Meteorological Imager Scene and Timeline Creator (MISTiC) provides simple means to define scenes and timelines

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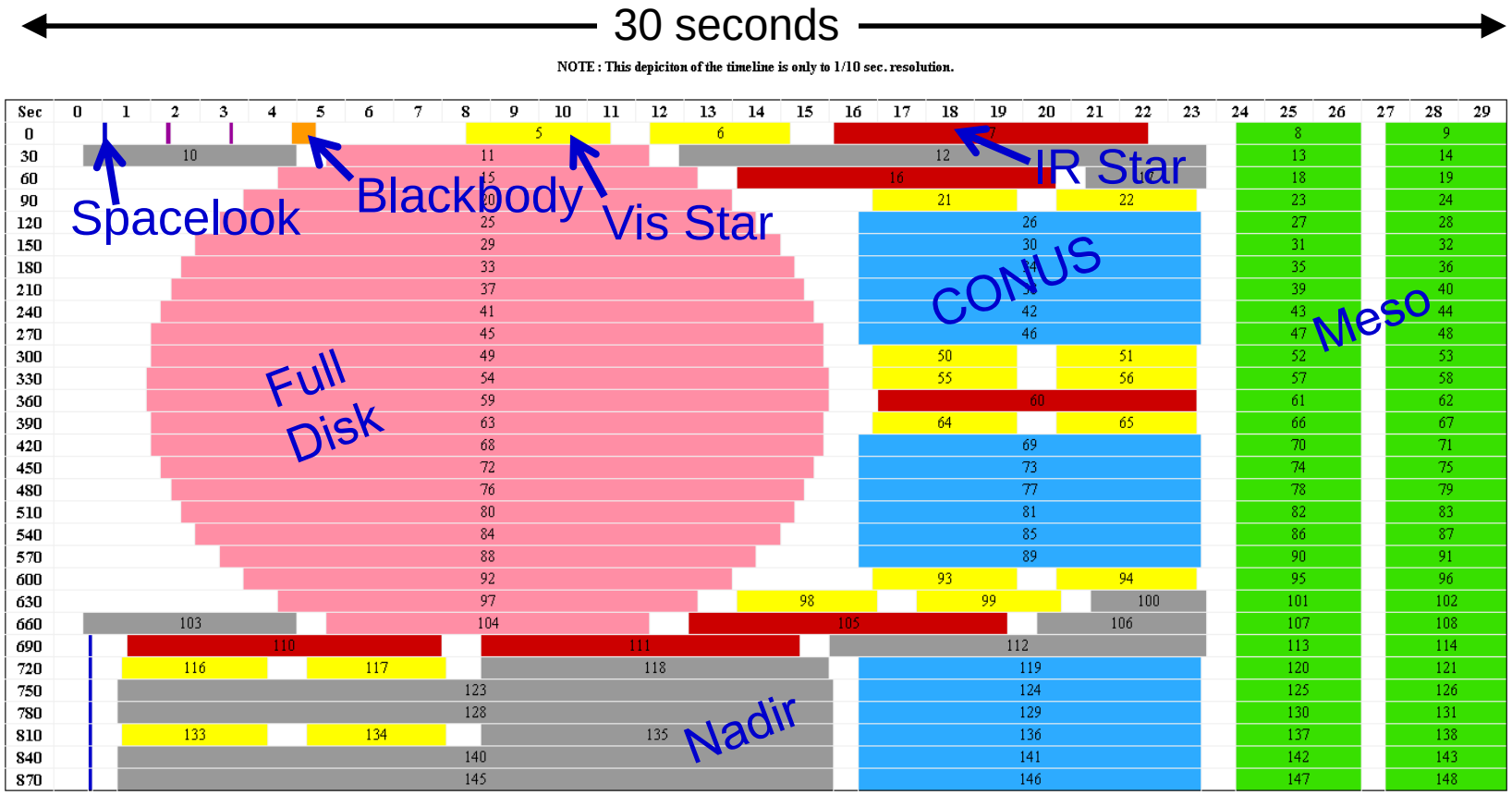
Scan Mode 3 Timeline (Flex Mode) Delivers Storm Watch Every 30 Seconds



Note: Autonomous spacelook collected with each Full Disk swath

MISTiC

Meso: one every 30 seconds or two at 1 minute intervals each

Scene locations can be changed on the fly (no interruption of timeline)

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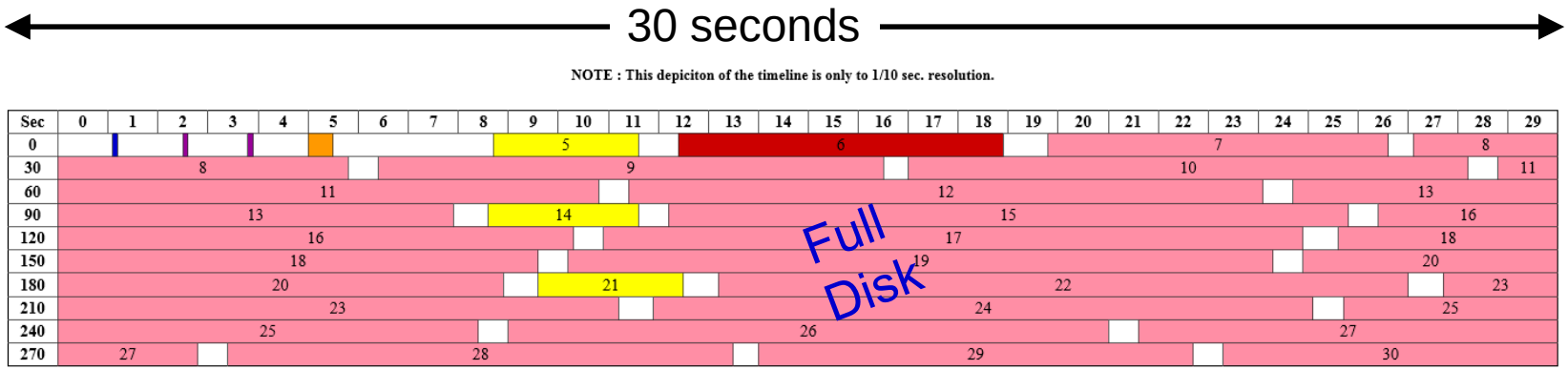
Scan Mode 4 Timeline (Continuous Full Disk) Provides Full Disk Every 5 Minutes



Note: Autonomous spacelook collected with each Full Disk swath

Scan Mode 4 timeline used when no rapid scan imagery desired

ABI Images (Scenes)	Image Collection Revisit Intervals (minutes)				
	Scan Mode 4 (Continuous Full Disk)	Scan Mode 3 (Flex Mode)		Scan Mode 6 [Not Operational]	
Full Disk	5	15		**10**	
CONUS	---	5		5	
Mesoscale #1	---	0.5	1	0.5	1
Mesoscale #2	---	---	1	---	1

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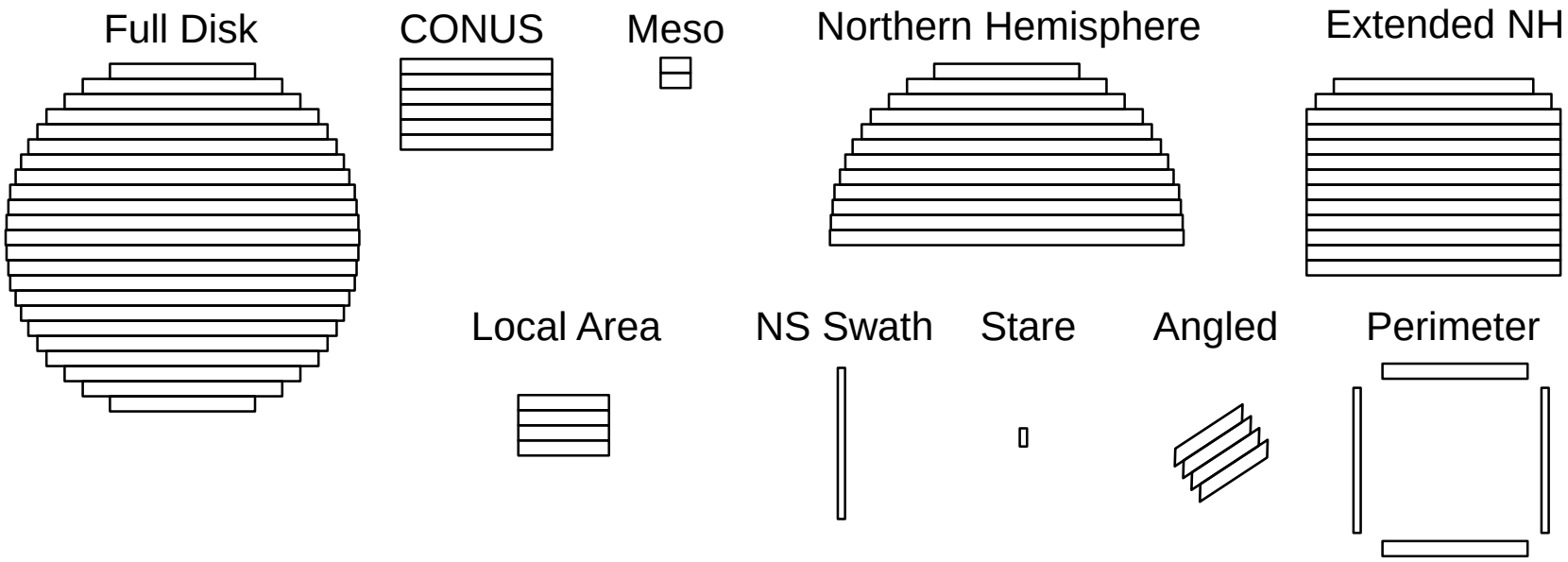
Harris' ABI Offers Unique Operational Flexibility for Image Collection



Stares and NS swath support vicarious calibration for GSICS

All scenes and timelines can be updated in orbit

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Example: Purely North-South Scan

Purely NS scan permits every detector element of a single channel to observe same scene

Stable uniform scene provides accurate relative calibration within each channel

- Absolute calibration if source radiance well known

Requires 16 swaths (one per channel)

Swaths tailored to each instrument

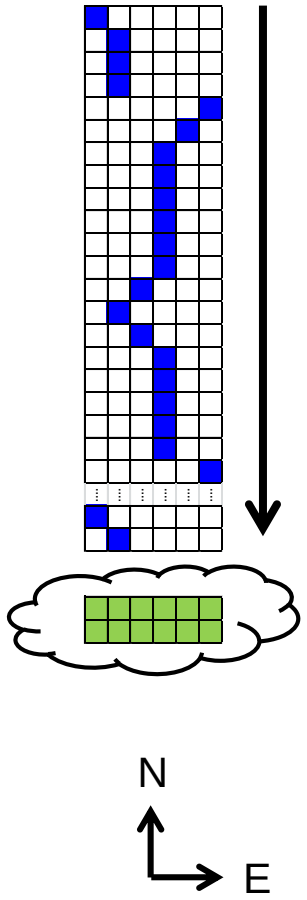
- Start and stop match south and north detector line-of-sight
- Swath tilt compensates for FPA rotation
- Duration based on NS IFOV so samples collected at same NS location

Vicarious calibration scene much smaller than NS FOV

- Size based on detector element NS IFOV & FPA EW IFOV, plus pointing uncertainties

Spacecraft yaw compensated by OMC

Collections of different scenes and locations permit effects of scan angles and spectral content to be assessed



See Frank Padula's presentation Wednesday at 4:45

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ABI Post-Launch Testing From January to June: Calibration, Verification, and Characterization

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Radiometric

- SNR & NEdT
- Dynamic range
- Linearity
- Calibration accuracy
  - On board and vicarious
- Calibration repeatability
  - Desert & Moon
- Stray light assessment
- Coherent Noise

Spatial

- MTF
- Response vs. scan angle

Spectral

- Uniformity across swath

Image Navigation & Registration

- Navigation
- Frame-to-Frame
- Within Frame
- Swath-to-Swath
- Channel-to-Channel

LOS

- Diurnal line-of-sight variation
- Pointing accuracy
  - Stars
  - Landmarks

Trending

Initial results Wednesday at 4:15

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GOES-R ABI Ushering In A New Era in US Weather and Environmental Monitoring

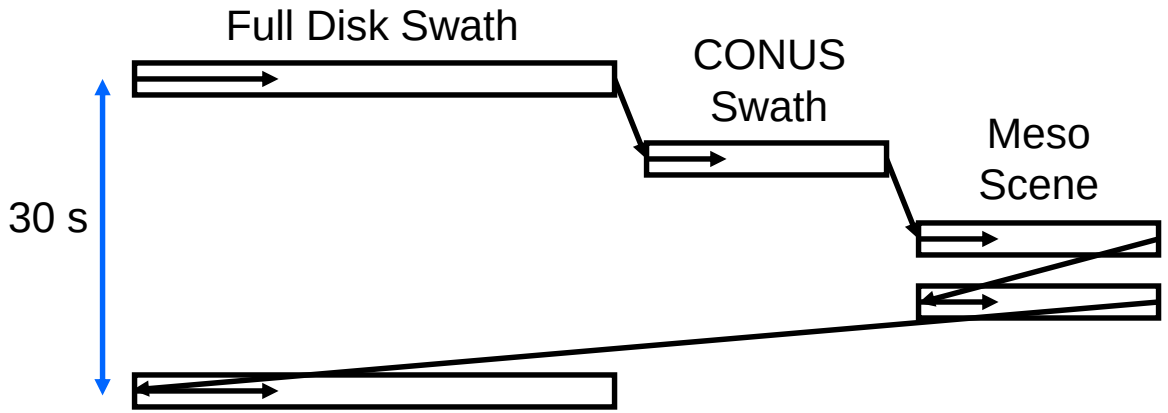
Improved Imagery

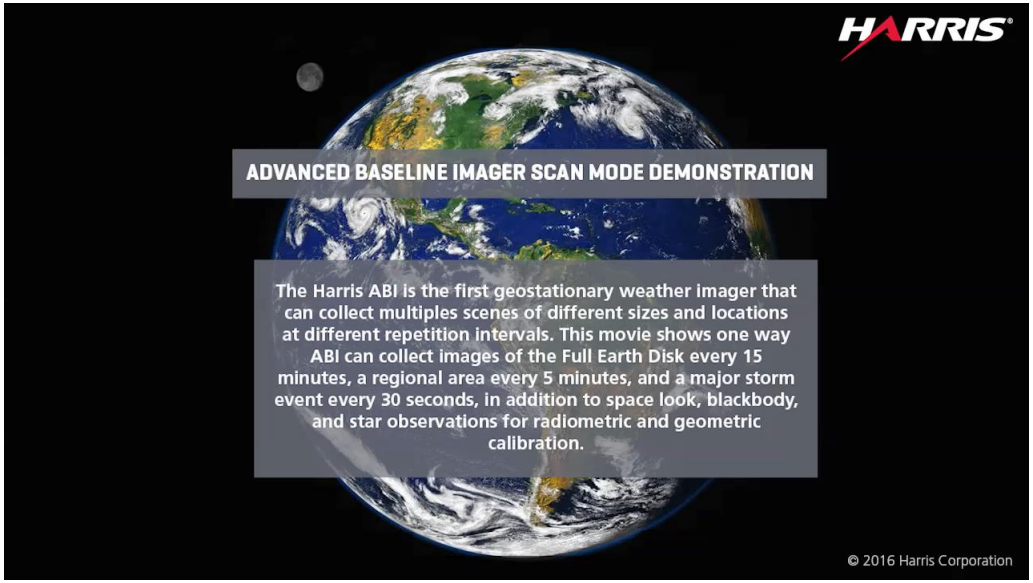
- 3x Spectral
- 4x Spatial
- 5x Temporal

Operational Flexibility

- Different sizes
- Different locations
- Different repetition intervals
- One instrument

Enhanced Weather Products Rapidly Delivered





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